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“HIGH LEVEL” METEOROLOGICAL STATIONS.

WE may as well begin this note with a few definitions, because they may be useful to one or two readers, and cannot do harm to any one:—

- A **First Order Meteorological Station** is one where all the principal meteorological elements—pressure, temperature, direction and velocity of wind, humidity, and rainfall, are continuously recorded by self-recording instruments.
- A **Second Order Station** is one provided with a full set of standard verified instruments, which are observed *at least* twice a day, viz., at 9 a.m. and 9 p.m.
- A **Climatological Station** must have the following standard verified instruments—Dry and wet bulb thermometer, also maximum and minimum thermometers, all placed in a Stevenson's screen, and also a rain gauge, all which instruments are read at 9 a.m. daily.
- A **Rain Gauge Station** is, of course, a station supplied with a rain gauge, but not with the other instruments needful for qualifying it to pass into the higher classes.

Our readers may recollect that Mr. Stow and others have, from time to time, urged the importance for the purposes of accurate daily weather forecasting, of obtaining telegraphic records from stations at considerable altitudes. At present, high level *rain gauge stations* are somewhat numerous. In *British Rainfall*, 1879, we find perfect returns from fifty-three stations, all more than a thousand feet above the level of the sea, and the following twelve are 1,500 feet or more:—

Derby	Buxton (Axe Edge)	1620 feet.
„	Comb's Moss	1669 „
Yorkshire	Skipton (Thorpe Fell)	1661 „
„	Langstrothdale (Cam Fell) ..	2000 „
„	Lune Head [Brough]	1779 „
Northumberland	Cheviot (Broadstruther)	1692 „
Cumberland	Sprinkling Tarn	1985 „

Westmoreland	Kirkstone Pass	1500 feet.
"	Hurth Syke [Alston]	2000 "
Perthshire	Ledard	1500 "
"	Glen Finlas	1800 "
Forfar	Kirriemuir (Creich Hill)	1500 feet.

Owing to the great difficulty which arises in the measurement of snow, very many of the records from the loftiest stations were absent last year, and therefore as regards *Rainfall Stations* we think that the numbers at present at work are about as follows:—1,000 ft. or more, 60; 1,500 ft. or more, 20; 2,000 ft. or more, 5; 3,000 ft. or more, 1.

We now turn to *Climatological Stations*, and their approximate equivalent, *Telegraphic Reporting Stations*.

In Devonshire there is a complete Second Order Station, maintained at the cost of the Meteorological Society, at Prince Town, Dartmoor, 1,389 ft. above the sea. As the most cordial relations prevail between the Meteorological Society and the Meteorological Council, the latter being the body under whose authority the daily weather reports are issued, we cannot understand why the records from this station are not inserted in the daily weather reports, especially as the telegraph office is close to the instruments. It cannot be that the Meteorological Council do not care for high level records, for we shall presently show that they have gone to the expense of establishing a paid station in another district.

Proceeding northwards, we come next to the new station, the establishment of which suggested this article. There is a large tract of somewhat high land in the north-east of Staffordshire, joining, in fact, that of West Derbyshire. It is not so well provided even with rain gauge stations as is desirable, but we have for several years received records from:—

Cheadle (Tean Vicarage)	altitude 470 feet.
* " (The Heath House)	" 647 "
Alstonfield	" 910 "
Leek	" 538 "

* Complete *Second Order Station*.

A year or so since, Mr. Clement L. Wragge established a *Climatological Station* at Farley, four miles East of Cheadle, and 643 ft. above sea. Then he induced the station master at Oakamoor, one mile West of Farley, and 293 ft. below it, to take charge of the necessary instruments, and to make the observations necessary to constitute that a second *Climatological Station*, and recently he has started a third *Climatological Station* on the summit of Beacon Stoop, the highest point of the Weaver Hills, two miles N.E. of Farley, and 1,205 ft. above sea level. There is no dwelling near this station, and Mr. Wragge or his assistant has, therefore, a daily walk of four miles in order to make the observations, and much as we may admire the zeal which has promoted the establishment of the station, and the undertaking of the daily task, we think that even Mr. Wragge will

have to give it up when the hills are buried, as they often are, in a thick coat of snow.

North again of this group come the high Derbyshire stations, and here, as at Dartmoor, we have a complete *Second Order* station of the Meteorological Society, close to a telegraph office, and therefore available for weather telegraphy—we refer to Buxton, 987 ft. above sea.

In the West Riding of Yorkshire there are many *Rain Gauge* stations, at elevations exceeding 1,000 ft., and Mr. Binnie, C.E., has, we believe, the necessary instruments for furnishing *Climatological* returns from one or more stations on the gathering grounds of the Bradford Water Works, but we have not yet seen the observations in print, and they are not sent to the Meteorological Society. In the North Riding of Yorkshire the Meteorological Council have established their (only) high level station, virtually a *Second Order* one, at Hawes Junction, 1135 ft. above sea.

In Northumberland a full *Second Order* station used to exist at Allenheads (1353 ft.), but, although the record of the fall of rain is continued, we have not recently seen any details of temperature or other meteorological elements. This is a pity, for this station is like most of those we have mentioned, close to a telegraph office.

In Cumberland and Westmoreland there are *rain gauges* at various heights up to 3200 ft., but there are no regular climatological stations at any considerable height.

Finally, we may sum up the whole in the following table:—

County.	Station.	Equipment.	Altitude.
Devonshire	Dartmoor.....	Second Order...	1389 feet.
Stafford	Beacon Stoop	Climatological..	1205 "
Derbyshire	Buxton	Second Order...	987 "
Yorkshire.....	Hawes	" "	1135 "
Northumberland...	Allenheads	" "	1353* "
and in Scotland—			
Dumfries	Wanlockhead	Second Order...	1334 "
Peebles	North Esk Reservoir...	" "	1150 "
Perth	Dalnaspidal.....	" "	1500 "
Aberdeen	Braemar	" "	1114 "
"	Tillypronie	" "	1120 "

* Perhaps discontinued.

REVIEW.

Aus dem Archiv der Deutschen Seewarte. I. JAHRGANG, 1878.
Herausgegeben von der Direktion der Seewarte. 4to. Hamburg, 1878. [1880.]

THIS is so excellent a volume that we are sorry to begin with a complaint, but it is too bad to put the imprint of 1878 at the foot of the title-page of a book printed in 1880. English publishers, in order that books may look new, date all those published late in the autumn of one year as if they had appeared in the next year; for instance, a book published in November, 1880, will be dated 1881.

This will prove sufficiently puzzling to future bibliographers, but Dr. Neumayer has gone the other way, and while he correctly puts 1878 in the body of the title, quite incorrectly puts the same date at the bottom of the page as that of publication. That there is not a shadow of doubt as to the wrongness of these figures is proved by the Introduction being dated February, 1880.

Being the first volume of the quarto publication of the German Naval Observatory, much space is naturally devoted to a description of the organization of the department, of the premises, and of the instruments. The details of the organization and of the staff possess only national, not international, interest, except as regards Englishmen and Australians, who will be glad to find at the head of the establishment Dr. Neumayer, who was for many years director of the Flagstaff Observatory, Melbourne, and while there published much valuable information. The equipment of apparatus at the chief Observatory at Hamburg is, however, of general interest, and we therefore epitomize it.

ANEMOMETER. — The Casella-Beckley or Meteorological Office pattern.

SOLAR RADIATION.—Bright and blackened bulb thermometers *in vacuo*, erected on the roof.

RAIN GAUGES.—Two, of which the construction is not stated—one in the garden near the compass-testing house, the other on the roof of the Naval Observatory.

THERMOMETERS.—There are duplicates; the majority are placed opposite north windows on the first floor (but for the sake of comparison a thermometer stand has been erected in the garden); outside these windows are a psychrometer (*i.e.*, a dry and wet bulb thermometer), several hygrometers, and two recording thermometers, one a metallic one on Hipp's plan, and one on Schreiber's. There is also a "Vakuometer" for testing marine barometers, and we should be glad to know whether any reason exists for the same term (spelled, however, with a c, "Vacuometer") not being applied to these arrangements wherever erected.

BAROMETERS.—The standard barometer is of the pattern known upon the Continent as the "Cistern-syphon-barometer," and known in England as the Russian barometer. There are also two recording barographs, one upon Schreiber's system, and the other a recording aneroid by Hipp.

The next section of the work describes the subsidiary establishments, which are under the control of the chief observatory. These are (1), chief agencies at Bremerhaven, Swinemünde, and Neufahrwasser, for the verification of nautical and meteorological instruments and for the instruction of naval officers; (2), secondary agencies at Memel, Lübeck, Rostock, and eleven minor ports; (3), nine first order meteorological stations, and a considerable number of secondary and telegraphic stations.

Under the head of "Library and Collection of Maps," Dr. Neumayer is in the happy position of being able to announce the purchase, for £1500, of the splendid library of Professor Dove. Its real value will be ascertained only when the catalogue appears, but there can be no doubt that it is nearly, if not absolutely, the best meteorological library in the world. The total number of volumes (or rather of *Bände*, which is perhaps rather a smaller number of sheets than an Englishman would call a volume) was about 8,000, of which about 2,500 are described as purely meteorological. We need not say that we are very anxious to see the catalogue. One very excellent feature in Dr. Neumayer's arrangement is that this grand collection is open to the public from 9 to 3 daily, excepting Sundays and fête days.

Another good feature is the holding of evening meetings, presided over by the director, at which the publications received from foreign countries since the last meeting are discussed, so that the whole staff of the observatory may be acquainted with what is being done.

We are glad to find in this volume that which, we presume, is a reprint of the *Instruktion für den Meteorologischen Dienst der Deutschen Seewarte*; it occupies 60 quarto pages, and detailed notice of it cannot therefore be given upon the present occasion.

AURORA BOREALIS.

Professor Sophus Tromholt, of Bergen, has been organising a system for observing the aurora borealis in Norway, Sweden, and Denmark, and he desires to extend it to Iceland and to Great Britain. There are reasons for believing that we are approaching a period of maximum auroral coruscations, and Professor Tromholt is desirous of enlisting observers on the same system as he has introduced into Scandinavia. The necessary instructions will be sent to anyone applying to him at Bergen before the end of August.—*Public Opinion*, July 17th, 1880.

THE MINIMUM OF -23° AT BLACKADDER.

FURTHER CONFIRMATORY EVIDENCE.

"In a communication we have received from Tweedside in the district where the extremely low temperature of 17° below zero was recorded last winter, our correspondent writes—'I have not an apple or pear on my ninety trees in the orchard, and on the walls only one, two, or three. Many of the old apple and pear trees have died in the orchard here; and close to Swinton House I saw rows of old oaks probably one hundred years old without any appearance of vegetation. It has been a dreadful winter, but at Hope Park, with the exception of one peach tree and one apple tree, I have escaped with a little scorching. There is no fruit anywhere.'"—*Journal of Horticulture*, July 1st, 1880.

A THUNDERBOLT (!).

[The following paragraphs have appeared in the *West Middlesex Advertiser*, but, as though written in a very popular style, they may possibly amuse some of our readers, and may instruct others, we, therefore, reprint them *verbatim*.—ED.]

“FALL OF A THUNDERBOLT.

“During the storm which burst so suddenly in many parts of London on Saturday last, the 26th June, what is commonly called a thunderbolt fell in Chelsea. Mercifully no one was injured, though a portion of a chimney stack was shattered. As the circumstances in this case throw light on the origin of “thunderbolts” or “ærolites,” it may be interesting to our readers to give them in detail. About 3 p.m., in the midst of many peals of thunder, one clap was heard which sounded far louder and sharper than the others, and gave one the idea of a conservatory being shattered. At this time, what appeared like a ball of fire fell on the chimney stack of 180, Oakley-street. The servants sitting in the kitchen were suddenly alarmed by the room being filled with smoke and a heavy black mass falling down the chimney into the grate, where it appeared to break and scatter fragments over the room. They naturally rushed from the room, but as soon as they recovered from their fright, and the smoke had somewhat dispersed, they returned to the kitchen to ascertain what had really happened. Among the *débris* in the grate a piece, apparently of a ball about 8 or 9 inches in diameter was found, like a cinder with here and there fragments of metal in it. In getting it out of the grate it was unfortunately broken, being very brittle, and with the other contents of the grate was thrown out in the back garden. Curiosity, however, soon dispersed the fragments in many directions, so that a practical investigation as to the weight, &c., was rendered impossible. One piece, the largest we saw, about 3 in. by 2 in., which is now in the possession of Miss Eleanor Davies, goes far to support the theory that ærolites do not drop from the clouds, but are the result of the fuzing together by the lightning of the matter where it first strikes the earth. This piece has all the appearance of having been exposed to great heat, but in its midst is distinctly visible a small piece of red brick. The lightning passed into the earth, and it is a source of thankfulness that no one in either this or the adjacent house was in any way affected by it.”—*West Middlesex Advertiser*, July 3rd.

“FALL OF A THUNDERBOLT.

“[We have made further investigation into the facts connected with the electrical discharge recorded in our last; and it appears that what is described as a ‘ball of fire’ was seen to fall on the house No. 180, Oakley-street. The servants who were in the kitchen at the time, being much alarmed at a quantity of smoke and soot coming down the chimney, ran out of the room, and on their return found, firmly wedged in the grate, a ball, about 7 or 8 in. in diameter; they attempted in vain to get it out, and broke it with a poker; it was very hard, and was composed of particles of mortar, brick, soot, cinder, &c. We submitted the most perfect fragment we could find to G. J. Symons, Esq., F.R.S., the president of the Meteorological Society, and he has favoured us with the following interesting letter.—ED. W. M. A.]

“To the Editor of the *West Middlesex Advertiser*.

“SIR,—As I am indebted to your courtesy both for the account of the above given in the *West Middlesex Advertiser* of July 3rd, and also for an examination of portions of the matter found in the grate, it is only fair that the conclusions to which I have been led should first be offered for insertion in your columns.

“With your original account I have only one fault to find. You, like nineteen persons out of twenty, or ninety-nine persons out of every hundred, do not put clearly the difference between thunderbolts (which do not exist) and ærolites (which do).

"An *ærolite* (*Æρ* air, *λιθος* a stone) is a shooting star, is in fact an infinitely small world, a mass of stone or of metal, whirling through space at an enormous velocity, and which, coming near to the earth, is, by the attraction of that body, compelled to fall upon it. These may be of any size from a few inches across to many feet. There are some large ones, and fragments of many others in the British Museum; but their fall has obviously no connection with thunderstorms.

"Thunderbolts, I have already said, do not exist. I have been trying to find one for a quarter of a century, and have always failed. The following paragraph from the *Meteorological Magazine* for August, 1866, may amuse your readers, and also show how carefully one must scrutinise every report.

"THE TRUE HISTORY OF A THUNDERBOLT.

"On July 2nd one of the London papers startled some of its readers by inserting a letter on the thunderstorm of June 30th, in which the writer said, 'At six o'clock it broke out again with increased violence, the rain descending in torrents, and at a few minutes past seven a thunderbolt fell in the gutter opposite my house (in Westbourne Park, Notting Hill,) and was smashed to pieces, one of which I have. At the hour at which I write, numbers of persons are still searching for the fragments.'

"Feeling certain that there was a week point somewhere, inasmuch as "thunderbolts" have no existence, we called on the writer and other residents, found the story amply confirmed, received several pieces of the "thunderbolt" (by the bye, some were sold at 10/- and 15/- each), and eventually ascertained that one of the pupils of an analytical chemist had availed himself of his tutor's absence to fill a capsule with materials calculated to burn vigorously, and explode in heavy rain, and, during the height of the storm, had thrown the burning mass into the gutter, so making an artificial thunderbolt. It is no wonder that the neighbours were taken in by a trick so well arranged."

"You have, I believe, hit off precisely the origin of the idea, which is very widely held, of the fall of a solid bolt when you say that the fragment in the possession of Miss Davies 'goes far to support the theory that *ærolites* (should be thunderbolts) do not drop from the clouds, but are the result of the fusing together by the lightning of the matter where it first strikes the earth.'

"Lightning, which is like a momentary electric light, is intensely heating, and in the British Museum will be found several fulgurites, which are portions of sand which, by the heat of lightning, have been vitrified or fused into a glass-like substance. When lightning falls on a bed of sand, like, for instance, that between Boulogne and Abbeville, it has to penetrate to a considerable depth before it reaches the underground water stratum, and all along its course it vitrifies the sand. Hence fulgurites may sometimes be found as much as thirty feet long.

"The Oakley-street occurrence is, to the best of my knowledge, unprecedented. Dozens of chimneys (especially kitchen chimneys, because in summer it is usually only from them that heated air is escaping) are struck every year, and generally the contents of the grate are scattered over the room amid a blaze of light. But in your account there is no indication of either light or noise being markedly present in the kitchen, nor of the sulphurous smell which almost always accompanies a discharge of lightning. It is very unfortunate that more of the fragments have not been recovered, but those which I have seen lead me to think that the lightning cleared the chimney of soot and of some fragments of brick and mortar, and on reaching the grate fused into a single lump the sweeping from the chimney and the fragments of coal which were in the grate. The principal fragment contains brick and coal, some of the latter burnt, some unburnt. Obviously this coal could not have been at the top of the chimney, and hence it is that I hold that the agglomeration occurred not at the top of the chimney but in the grate.

"Nothing fell from the sky; but the lightning, instead of scattering the contents of the chimney and of the grate, fused much of them into a single lump.

"62, Camden-square, N.W."

"Your obedient servant,

"G. J. SYMONS.

WATERSPOUT IN GLAMORGANSHIRE.

"The extraordinary atmospheric disturbances which have caused such destructive floods in South Wales seem to have culminated on Thursday week [July 22nd]. On the afternoon of that day a waterspout passed over Gower [the name of the South-west of Glamorganshire.] The waterspout was distinctly seen by a large number of people. The day had been sultry, though about one o'clock there was a heavy fall of rain for upwards of an hour. This shower, like most of those that have lately been experienced, was quite local, no rain at all having fallen at Swansea at the time. After the shower the sun shone brightly till four o'clock, when the thunder clouds were seen to be again gathering. The spout was first noticed about half-past four, at which time it was fully developed. It appeared to be about four miles off, in the neighbourhood of Penclawdd, and to be moving eastward. It consisted of a long slender column of dense vapour or rain descending from the clouds to the earth, and tapering gently towards the lower end, which was hidden from view by the rising ground at the head of the valley. The outlines were perfectly sharp, and clearly defined. It continued in this condition about five minutes, and then the lower portion gradually faded away, the upper part becoming at the same time more ragged. Ultimately what remained was absorbed in the heavy black clouds from which it originated, and these passing eastwards discharged for about an hour a perfect deluge of rain over Clyne Valley. The waterspout was observed from the vessels which entered the port of Swansea. It is described as originating near Oxwich Bay. A column of water was whirled up from the sea to meet a corresponding column descending from the clouds. The waterspout must afterwards have been carried completely across the peninsula of Gower to the spot where it was seen to dissolve."—*Hereford Times*, July 31st.

[There is no rain gauge in the district above mentioned, hence the above is probably the only record of the phenomenon. Waterspouts very rarely pass over rain gauges. Out of three reported in 1879—viz., those on April 26th, near Wolsingham, Durham; June 12th, Kilrea, Londonderry; and August 30th, Drum Park Hill, Dumfries—the last is the only one of which even a partial record was obtained. It gave at the station at Drum Park four inches of rain between 2 and 6 p.m.—ED.]

WATERSPOUT IN HERTFORDSHIRE. (?)

To the Editor of the Meteorological Magazine.

SIR,—I am afraid you have no observer in the vicinity of Hoddesdon; but last Wednesday there appears to have fallen something like a waterspout over the Wormley Woods, causing the water in Miss Warner's grounds at Hoddesdon to rise 10 feet. People who saw the clouds, describe the storm as taking a conical form, and, to use their expression, the top of the cone suddenly fell in. There were

also enormous hailstones in the neighbourhood ; and a tree was struck with lightning, whilst the sun was shining, on the cricket-field at Essendon—altogether it seems to have been an eccentric sort of day. I should imagine it threw the storms of August last year and July the year before quite into the shade.—Yours truly,

W. LUCAS.

Hitchin, 20th July, 1880.

RAINFALL PERIODICITY.

To the Editor of the Meteorological Magazine.

SIR,—I cannot help wishing that you would call attention to the frequent recurrence of very heavy falls of rain *about* the 24th–26th of the month, especially in the later months of the year. I called Mr. Dines' attention to this some years ago, and he agreed with me that the phenomenon certainly did exist.

In a long series of years (say 50), on the mere doctrine of chances, heavy rainfalls should be dotted about the various days of the months so as to be nearly equally distributed, at least, in each of the three decades. But the longer the series you examine, the more you find that they tend to cluster round certain periods, as *nuclei* (so to speak).

My health and want of leisure preclude my attacking this problem fully. I wish you would ask for observations. If anything like positive monthly periodicities can be scientifically established, a real step onwards would be gained.

Some figures which I worked out from 40 years, given me by Mr. Dines, show that heavy rains *are pretty equally* distributed through the year, except in the following cases :—

January 12	Expectancy 5	times greater than average.
May 6, 7, 8.....	2½	” ” ” ”
June 12	3	” ” ” ”
July 18	2	” ” ” ”
” 23	3	” ” ” ”
” 26, 27	2	” ” ” ”
August 10	2	” ” ” ”
” 13, 14	3	” ” ” ”
” 21, 22, 23	2	” ” ” ”
September 27, 28	3	” ” ” ”
October 22, 23	2	” ” ” ”
” 25, 26	1·8	” ” ” ”
November 24, 28, 29 ...	2	” ” ” ”

In each case the relative expectancy of heavy falls for the particular month is taken.

For the whole year the expectancy of heavy fall (0·4 in. and over) for any one day being assumed at 100, I find that the expectancy for the first decade of any month is 94, for the second decade 104, but for the 23rd to 28th, inclusive, 129.

In the Greenwich (1 in. and over) rainfalls 1815–68, the total amount of these great falls for the first decade of *all* months combined is 25·56 in. ; for the next 11 days, 39·70 in. ; and for the last

decade (raising the 31st proportionally) 57·70 in. This corresponds with the results of more moderate falls, as above.

Of course, I do not assume a mere "monthly periodicity;" but all my study tends to shew me the high probability that the position of the sun with regard to the earth does somehow give a distinctive character to each day of the year, in mean expectancy of wet or dry, &c., &c., so that, on the average, the same wet and dry days tend to recur yearly.

Why some of the great outbursts of solar reaction should be separated from each other by about 30 days' interval, I cannot guess. But the *fact* is indubitable to all those that will work it out.—I am,
 dear Sir, faithfully yours,

P. H. NEWNHAM.

Maker Vicarage, Devonport, August 10th, 1880.

HEAVY RAINFALL.

To the Editor of the Meteorological Magazine.

SIR,—A remarkable rainfall, I think I may say unexampled here in this century, occurred on Saturday, 17th inst., between 2.15 and 4.5 p.m. We had been having a good deal of rain— $3\frac{1}{2}$ inches since 1st inst.—but the 14th, 15th and 16th were fine, and the 17th was also fine and sultry, but becoming more and more cloudy towards 1 p.m. In 1 hour and 50 minutes there fell at Stevenstone (the Hon. Mark Rolle's Mansion) 3·05 in.; at this place, three quarters of a mile west from Stevenstone, 1·91 in.; at Torrington, $1\frac{1}{4}$ miles west from this place ·95 in. A few miles east of Stevenstone there was little or no rain. At Budleigh, in East Devon, we only had an evening shower of ·17 in., but at South Molton, 16 miles north-east from here, there was a terrible hail storm, of which you will doubtless receive accounts, but a sample leaf of mangle (or mangold) has reached me which looks like a Peninsular flag! The rainfall here for this month is already 6·16 in. At Budleigh it is 2·10 in. Budleigh is about 45 miles from Little Silver as the crow flies. There we have only just had rain enough, and everything agriculturally looks more than well. Here no harm to speak of has been done to crops, there being no wind whatever last Saturday, and generally they promise well.—Yours faithfully,

R. H. LIPSCOMB.

Little Silver, Torrington, N. Devon, July 23rd, 1880.

THE WEATHER IN JULY.

As in the case of its immediate predecessor, July opened with very unsettled weather. A depression off the north coast of Scotland was in motion from W. to E. on the 1st, and arrived over Norway on the next day, followed on the 3rd by another, well-defined, but moving very slowly; also subsidiary depressions over England. By the following day the centre of this depression had reached the Dutch coast, and on the 5th was over Denmark. In the rear pressure increased generally; readings on the 5th were highest off our S.W. coasts, and gradients for W. to S.W. winds were slight.

Temp. below the average throughout our Islands, especially in the Midland Counties, S., and N.W. England. The highest readings were registered in the west and south on the 4th or 5th; the lowest occurred mostly on the 5th; but in some parts of the English Midland and Eastern Counties on the 2nd or 3rd.

Rainfall rather less than the mean in N.E. and S.W. England ; about equal thereto in central and N.W. England ; but more than the average elsewhere.

Bright sunshine was of somewhat shorter duration than during the last week of June in Scotland and N.W. England, but exceeded it in all other districts. The per-centage of total possible duration was in the north and north-west of England as low as 21 to 23, and the maximum was only 40 (in the south-west).

A continuance of similar conditions characterized the week (6th-12th). Readings were highest over France during the whole period. A depression was over the North Sea between Norway and Scotland on the 7th, and many subsidiary disturbances appeared over Ireland and England. The only difference on the next day was that the depression had become better defined. The charts of the 9th, however, shewed that the main depression had begun gradually to fill up ; but several small shallow depressions in various districts caused the weather to remain very unsettled and showery. A general increase of pressure took place on the day following, but the depression still maintained the same position, and small subsidiaries were reported from our south-western coasts and the Netherlands. The centre of the depression had shifted eastwards by the 11th, and still further at the close of the week, and there was no continuance of subsidiary disturbances. As a consequence, the bar. rose considerably over the north of Scandinavia, and in a less degree over France and our Islands ; readings became fairly uniform, although rather higher in western France than elsewhere.

Temp. again less than the average throughout our Islands, the deficit ranging from 1° in Scotland to 4° in eastern, central, and southern England. The maximum was 75° at Rothamstead, 74° at Nottingham, and 73° at Durham and Cambridge ; the minimum, 43° at Hillington and Durham, 44° at Blackpool, and 45° at Aberdeen, Glenalmond, Leith, and Churchstoke.

Rainfall above the mean everywhere, except W. Scotland. The excess was as much as 2·54 in. at Barnstaple, and 2·28 in. at Shrewsbury ; while at Londonderry it was only 0·03 in., and at Dover 0·05 in.

Bright sunshine showed a slight increase over the preceding week in Scotland and N.W. England, but a falling off elsewhere. The maximum duration ranged from 45 hours at Glasgow, and 42 hours at Southampton and in the Isle of Man, to 16 hours at Armagh, 21 hours at Dublin, and 23 hours at Parsonstown.

The weather during the week (13th-19th) was fair in E. Scotland and S.W. England, but elsewhere dull, unsettled, and very showery. On the 13th the bar. was falling over Wales and in the South-west of England, whilst in all other parts of our Islands a slight rise took place, and in Scandinavia a brisk rise—hence the lowest readings were over Wales. By the next day this area of low readings had moved a little to the southward of the position which it occupied on the day before, and, meanwhile, a decrease of pressure took place over France. Barometric readings thus became highest to the northward of Scotland, and pressure was very irregularly distributed over our southern districts and the North Sea. Next day pressure decreased somewhat over the whole of our islands ; rather more so in the southern parts than elsewhere. Its relative distribution, however, was little altered. This large area of low readings over the south became very much smaller in the course of the day (15th), and the bar. rose briskly within that district. In the north, whence the highest readings were reported, the bar. fell slightly ; over Scandinavia, also, it fell, and an area of low pressure was shewn over the Gulf of Bothnia. During the day following pressure increased in the south, and decreased in the north ; readings thus becoming very uniform over the whole of Western Europe ; during the next day a decided decrease occurred over the whole of the United Kingdom, the eastern shores of the Baltic, and the north of France ; but the general distribution of pressure was little affected by the change.

Temp. was about equal to the average for time of year over Scotland and S. England, slightly below it elsewhere. The max. was 79° at Strathfield Turgiss and Southampton, 78° at Barnstaple ; the minimum 43° at Nairn, 44° at Churchstoke, and 45° at Markree Castle.

Rainfall less than the mean in E. Scotland and S.W. England, about equal thereto in N. Ireland, but in all other districts the fall was above the average. Heaviest falls, 2·86 in. at Llandudno, 2·61 in. at Leicester, and 2·51 in. at Silloth; slightest, 0·02 in. at Plymouth, 0·04 in. at Aberdeen, and 0·05 in. at Falmouth.

Bright sunshine slightly more continuous in Ireland, south-western and central England, and E. Scotland, than during the week preceding, but in all other parts of the United Kingdom it was much less prevalent. Maximum duration, 50 hours at Churchstoke, and 41 hours at Cirencester; minimum duration, six hours at Durham, and eight hours at York. The values for Durham and York are only 5 and 7 per cent. respectively of the total possible duration.

Fine weather was experienced in England and Ireland during the first two days of the next week (20th–26th), but for the rest of that period overcast skies and very showery, unsettled weather prevailed. In Scotland fine weather was experienced throughout the week.

On the 20th the bar. rose in all parts of our islands, and readings became much more uniform. During the next three days the changes in the distribution of pressure were very unimportant. On the 24th pressure decreased in all parts of Western Europe, but the change being moderately uniform, the distribution of pressure was little affected.

Temp., except in W. Scotland, was slightly below the average. The highest reading was only 80° at Nottingham, 79° at Rothamstead, and 76° at Durham, Cambridge, Loughborough, and Strathfield Turgiss; the lowest of the minima (42° at Markree Castle, and 43° at Parsonstown) occurred at most stations early in the morning of the 21st. The lowest of all the minima (40° at Nairn) occurred on the 25th.

Rainfall less than the mean in Scotland, more elsewhere; heaviest falls, 2·22 in. (1·62 in. above average) at Falmouth, and 2·14 in. at St. Leonard's and Londonderry; lightest falls, 0·07 in. at Aberdeen, 0·08 in. at Ardrossan, and 0·15 in. at Laudale. In N.E. and N.W. England, and S. Ireland the excess was not large.

Bright sunshine this week shewed an improvement upon the preceding, but the number of hours was still rather small. Maximum duration, 67 hours at Valentia, and 56 hours at Aberdeen; minimum duration, 25 hours at York and Churchstoke, and 34 hours at Durham.

During the remainder of July the weather was dull and very rainy in nearly all parts of the United Kingdom.

During the night (25th–26th) a large depression advanced to our south-western coasts, causing the bar. to fall over the whole of our islands—the change in the south-west amounting to nearly half-an-inch. It continued to advance eastwards during the 26th, and by 8 a.m. on the 27th was shewn over the S. of Scandinavia, Denmark, and a part of the Baltic. In its rear a moderately brisk recovery began; but there were indications of a fresh fall, which indications were verified by the appearance of a small but well-defined depression over the northern half of Ireland. This travelled away, taking a tortuous course in a north-easterly direction, during the 28th, and was over the extreme N. of Scotland on the morning of the 29th. In the meantime a secondary disturbance advanced to over S. Wales and the W. of England, and thence to the Shetland Isles, where it halted. During the night (29–30th) another secondary depression travelled across the S. of England, until its centre was, on the morning of the 30th, in the neighbourhood of London. Both disappeared in the course of the day, the wind veered to W. or N.W. very generally, and the sky cleared in most places.

Temp. below the average throughout our islands. In most districts the deficit was 3°, but in E. England, 4°. Both the maxima and the minima were very low for the time of year, the highest reading being 75° in London on the 27th and 28th, and the lowest of the minima 41° on the 30th at Parsonstown. In most districts the lowest readings ranged from 43° to 45°.

Rainfall in excess of the average everywhere. In E. Scotland, N. Ireland, Central and Southern England the excess was rather large.

Bright sunshine was of longer duration than previously in the Western Central and North-Eastern parts of Great Britain, but elsewhere there was a decrease.

Lowestoft.

H. E. M.

NOTE.—Thunderstorms were of frequent occurrence during the month in many districts.

SUPPLEMENTARY TABLE OF RAINFALL IN JULY, 1880.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger	5·14	XI.	Corwen, Rhug	7·25
„	Margate, Acol	3·13	„	Port Madoc	8·40
„	Littlehampton	3·20	„	Douglas	4·66
„	St. Leonards	4·00	XII.	Carsphairn	4·25
„	Hailsham	3·28	„	Melrose, Abbey Gate ..	3·90
„	I. of W., St. Lawrence.	2·64	XIV.	Glasgow, Queen's Park.	4·18
„	Alton, Ashdell	4·96	XV.	Islay, Gruinart School..	2·43
III.	Great Missenden	5·79	XVI.	Cupar, Kemback	2·34
„	Winslow, Addington ..	8·24	„	Aberfeldy H.R.S.	...
„	Oxford, Magdalen Col...	5·05	XVII.	Tomintoul	4·48
„	Northampton	7·36	„	Keith H.R.S.	7·22
„	Cambridge, Merton Vil.	3·78	„	Forres H.R.S.	3·40
IV.	Harlow, Sheering	4·17	XVIII.	Strome Ferry H.R.S....	2·76
„	Diss	4·81	„	Auchnasheen H.R.S. ...	...
„	Swaffham	...	„	Lochbroom	3·85
„	Hindringham	3·86	„	Tain, Springfield	3·10
V.	Salisbury, Alderbury ...	4·03	„	Loch Shiel, Glenfinnan.	4·60
„	Calne, Compton Bassett	5·01	„	Dalwhinnie H.R.S.....	...
„	Beaminster Vicarage ...	3·61	XIX.	Lairg H.R.S.	4·70
„	Dartmoor, Princetown..	...	„	Altnabreac H.R.S.	4·92
„	Langtree Wick	9·53	„	Watten H.R.S.	2·88
„	Lynmouth, Glenthorne.	5·29	XX.	Fermoy, Glenville	4·58
„	St. Austell, Cosgarne...	4·59	„	Tralee, Castlemorris ...	5·29
„	Taunton	5·58	„	Cahir, Tubrid	4·59
VI.	Bristol, Ashleydown ...	...	„	Tipperary, Henry St....	6·04
„	Ross	5·96	„	Newcastle West	2·96
„	Wem, Sansaw Hall.....	7·84	„	Kilrush	4·09
„	Cheadle, The Heath Ho.	6·12	„	Corofin	5·26
„	Bickenhill Vicarage ...	6·01	XXI.	Kilkenny, Butler House	4·19
VII.	Melton, Coston	6·39	„	Carlow, Browne's Hill..	5·13
„	Horncastle, Bucknall ...	...	„	Kilsallaghan	5·54
VIII.	Walton-on-the-Hill	4·94	„	Navan, Balrath	...
„	Broughton-in-Furness ..	4·25	„	Athlone, Twyford	6·28
IX.	Wakefield, Stanley Vic.	6·48	„	Mullingar, Belvedere ...	6·90
„	Ripon, Mickley	5·74	XXII.	Ballinasloe	5·81
„	Scarborough	4·89	„	Clifden, Kylemore	4·64
X.	Mickleton	5·35	„	Crossmolina, Enniscoe..	3·89
„	Haltwhistle, Unthank..	6·48	„	Carrick-on-Shannon ...	5·17
„	Shap, Copy Hill	3·96	XXIII.	Dowra	4·76
XI.	Llanfrechfa Grange ...	7·08	„	Rockcorry	5·39
„	Llandovery	9·59	„	Warrenpoint	3·24
„	Solva	3·02	„	Newtownards	7·28
„	Castle Malgwyn	4·10	„	Carnlough	5·26
„	Rhayader, Nantgwillt..	6·66	„	Bushmills	4·49
„	Carno, Tybrite	6·44	„	Buncrana	...

JULY, 1880.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL.					Days on which 101 or more fell.	TEMPERATURE.				No. of Days in which Rain fell.	
		Total Fall.	Differ- ence from average 1860-5	Greatest Fall in 24 hours.		Deg.		Date.	Deg.	Date.			
				Dpth.	Date.								
I.	ENGLAND.	Camden Square.....	inches 5.10	inches. + 3.31	in. .85	3	23	79.2	25	47.5	31	0	0
II.		Maidstone (Hunton Court)...	2.60	+ .96	.46	25	23	...	...	...	...	0	0
III.		Strathfield Turgiss	4.73	...	1.09	14	21	78.5	16	45.3	5	0	0
IV.		Hitchen	4.88	+ 2.98	.66	11	25	72.0	18	47.0	4.30	0	0
V.		Banbury	5.33	+ 3.27	.72	14	27	74.8	23	43.0	10	0	0
VI.		Bury St. Edmunds (Culford)...	4.59	+ 2.60	1.24	21	23	80.0	16	43.0	4	0	0
VII.		Norwich (Cossey).....	4.62	+ 2.65	.79	26	24	78.0	16	45.0	21	0	0
VIII.		Bridport	3.43	+ 1.32	.73	30	16	...	...	...	...	0	0
IX.		Barnstaple.....	7.14	+ 4.28	1.79	9	20	79.0	23	47.0	14	0	0
X.		Bodmin	4.32	+ 1.21	1.45	25	21	74.0	20	50.0	15	0	0
XI.		Cirencester	7.32	+ 4.88	1.67	14	23	...	...	...	...	0	0
XII.		Shifnal (Haughton Hall) ...	5.49	+ 3.32	.72	6	26	74.0	23	45.0	5.11	0	0
XIII.		Tenbury (Orleton)	5.08	+ 2.70	.61	25	23	74.5	17	42.5	5	0	0
XIV.		Leicester (Town Museum) ...	6.74	...	1.21	14	24	73.0	23	47.0	3	0	0
XV.		Boston	5.70	+ 3.40	1.55	14	17	79.0	21	45.0	5	0	0
XVI.		Grimsby (Killingholme)	5.80	...	1.10	14	25	70.5	18*	47.0	5	0	0
XVII.	Mansfield	6.13	...	.94	26	25	71.5	25	47.2	21	0	0	
XVIII.	Manchester (Ardwick).....	5.32	+ 2.79	.75	18	23	78.0	17	51.0	31	0	0	
XIX.	York	5.76	+ 3.82	.66	26	23	...	...	...	...	0	0	
XX.	Skipton (Arncliffe)	7.26	+ 4.03	.78	2	26	78.0	17	46.0	7	0	0	
XXI.	North Shields	4.67	+ 2.86	.55	27	25	...	...	...	...	0	0	
XXII.	Borrowsdale (Seathwaite).....	10.05	+ 1.91	1.16	18	25	...	...	...	...	0	0	
XXIII.	WALES.	Cardiff	6.64	...	.98	17	23	72.3	16	47.4	31	0	0
XXIV.		Haverfordwest	4.19	+ .89	.86	31	14	77.0	17	44.0	30	0	0
XXV.		Aberdovey	...	...	...	...	...	...	...	...	...	0	0
XXVI.		Llandudno.....	6.67	+ 4.38	1.16	14	19	71.7	17	49.0	21	0	0
XXVII.	SCOTLAND.	Cargen	3.51	+ .79	.76	13	19	74.8	17	45.0	21	0	0
XXVIII.		Hawick (Silverbut Hall)...	4.93	...	.96	10	18	...	...	...	...	0	0
XXIX.		Douglas Castle (Newmains)...	5.30	...	1.55	24	21	...	...	...	...	0	0
XXX.		Loch Long (Arddaroch)	...	...	...	...	...	...	...	...	...	0	0
XXXI.	IRELAND.	Kilmory	3.32	...	.87	27	14	...	...	42.0	21	0	0
XXXII.		Mull (Quinish)	2.18	...	.77	5	18	...	...	...	...	0	0
XXXIII.		Loch Leven	3.70	+ 1.13	.90	2	11	...	...	...	...	0	0
XXXIV.		Arbroath	3.55	+ 1.00	.83	1	14	72.0	5.25	48.0	30	0	0
XXXV.	IRELAND.	Braemar	4.00	+ 1.72	.88	3	20	72.2	17	38.5	13	0	0
XXXVI.		Aberdeen	3.27	...	1.07	28	18	70.0	25	45.0	8	0	0
XXXVII.		Portree	...	...	...	...	...	...	...	...	...	0	0
XXXVIII.		Inverness (Culloden)	5.98	+ 3.31	1.57	8	12	72.6	16	42.8	5	0	0
XXXIX.	IRELAND.	Dunrobin	3.50	+ 1.75	.61	6	18	67.8	25	44.0	6.31	0	0
XL.		Sandwick	3.55	+ 1.66	.76	28	15	65.0	24	44.8	22	0	0
XLI.		Cork	1.84	...	.49	25	19	85.0	22	44.0	30	0	0
XLII.		Darrynane Abbey.....	...	...	...	...	...	...	...	...	...	0	0
XLIII.	IRELAND.	Waterford	...	...	...	...	...	...	...	...	...	0	0
XLIV.		Killaloe	6.14	+ 2.95	1.03	17	24	82.0	17†	40.0	31	0	0
XLV.		Portarlington	6.10	+ 2.56	1.16	17	24	74.0	17	44.0	16	0	0
XLVI.		Monkstown	7.12	+ 4.69	1.34	12	20	...	...	...	...	0	0
XLVII.	IRELAND.	Galway	6.58	...	1.28	17	20	72.0	17†	46.0	31	0	0
XLVIII.		Waringstown	4.72	...	.64	27	22	80.0	4	42.0	20	0	0
XLIX.		Londonderry	7.28	...	2.03	2	20	69.0	25	49.0	31	0	0
L.		Edenfel (Omagh)	4.72	...	1.48	27	25	79.0	17	40.0	30	0	0

* And 25.

† And 24.

‡ And 18, 23.

§ And 31.

+ Shows that the fall was above the average; — that it was below it.

METEOROLOGICAL NOTES ON JULY.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—Harvest prospects have become rather various, in consequence of the R having beaten down the best crops of wheat and barley. Grass plentiful. Camomile in flower on 1st; horned poppy on 11th.

HITCHEN.—The wettest July since 1875; temp. below the average of thirty years.

BANBURY.—An unusual amount of T and L; R exceedingly heavy on several occasions. The greater part of the grass not yet cut, and very little carried. High wind on 4th; H on 11th and 30th.

CULFORD.—A month of very unfavourable weather, proving in many instances destructive to the hay crop as well as injurious to corn. Mean temp. 61°·5; rainfall excessive; on the 21st, 1·24 in. fell in less than an hour, causing destructive floods. T occurred on 13 days. The weather was cold, and sunshine deficient.

COSSEY.—The total rainfall of the month was the same as that of July, 1879, but the heavy falls being further apart we escaped disastrous floods such as occurred then. The wheat crops are much laid; barley looks well, but much hay is still exposed to the weather.

BODMIN.—Average temp. 62°·1; no TSS during the month.

CIRENCESTER.—A very wet month, the greater part of the R being in T showers. On the evening of the 14th about 1·50 in. of R fell in less than half-an-hour; many cellars flooded.

SHIFNAL.—A month of TSS and R, the fall far exceeding that of July, 1879, but frequent sunshine relieved it. Temp. very low, not reaching 70° till the 11th, and only once reaching 74°. Bar. unusually equable. T, either near or distant, most days, the TS at 8 p.m. on 17th being fearfully severe. No wasps, and no butterflies but white. Potato blight appeared first on 22nd.

BOSTON.—The month has been remarkable for the constant succession of TSS and heavy R. Water stands on the land everywhere and the rivers are in full flood. On the Welland the inundations have been very severe, and the waters have risen higher than was ever known before. At Stamford the water rose as high as the pockets of the billiard table at the "George Hotel," and in the villages about Deeping Fen many of the streets were from three to four feet deep in water. The whole of the wash lands on the Welland are deep in water and 3000 acres of cropping totally destroyed.

KILLINGHOLME.—A month remarkable for T, L and R; the wettest July for many years; much hay still out; root crops abundant, but much fear is felt about the corn, which at the beginning of the month was very promising; L on nine days, T on fourteen.

MANSFIELD.—A very wet month; TSS on five days, and T or L on six others.

ARNCLIFFE.—Rainfall about an inch less than in July, 1879; much T and many TSS; a disastrous month for haymakers.

NORTH SHIELDS.—TSS on four days.

SEATHWAITE.—An exceedingly wet July; two slight TSS.

WALES.

HAVERFORDWEST.—Up to the 14th the weather was cool, but afterwards the days were warmer, sometimes sultry, and the nights uniformly warm. Air very thundery on the 9th, 17th, 26th and 30th; distant T heard, but no storm in this immediate locality. Heat very intense, and air most oppressive on 17th, and heavy storms in the E. and N.E. of the county. Hay crop splendid and saved in excellent condition; corn looks well though much beaten down by the heavy R on the night of the 30th, when '80 in. fell in an hour and a half. The temp. reached or exceeded 70° only on ten days.

LLANDUDNO.—A very wet month, the rainfall being nearly thrice the average. The temp. and amount of sunshine were both decidedly below the average.

An unusual amount of T from 12th to 16th. Grain crops and potatoes look well, but hay much damaged.

SCOTLAND.

CARGEN.—Temp. of month nearly 1° below average ; 24 hours less sunshine than the average. Harvest will be general in this neighbourhood about the middle of August.

HAWICK.—Severe TS on the afternoon of the 10th, .86 in. of R fell in 25 minutes, the ground was white with H, and the low-lying parts of Hawick were flooded. Hay crop light, and nearly over at end of month.

QUINISH.—A very fine and warm month, excellent for cereals and early-sown root crops, but rather dry for late grass and turnips. Hay crop mostly secured in very good order. Prevailing wind, N. ; no rough weather.

CULLODEN.—Month generally cold ; no really hot days. Rainfall considerable ; on the 24th .88 in. fell in 40 minutes.

SANDWICK.—Temp. $0^{\circ}\cdot8$ below the mean of 53 years. N.W. wind of about 40 miles an hour on 30th. Two peals of distant T on 11th.

IRELAND.

KILLALOE.—Unusually heavy rainfall with frequent TSS ; temp. high and equable ; hay harvest tedious.

MONKSTOWN.—A remarkably wet month, three days on which the fall exceeded one inch.

WARINGSTOWN.—Rather wet, but warm ; crops splendid ; potato disease showing on the 29th, but general crop safe as yet.

LONDONDERRY.—Temp. generally high, wind principally N.E. ; TS with heavy H on 24th, completely destroying the crops in places.

THE WINTER AND SPRING OF 1880 IN CANADA.

"Fearful tornadoes have been devastating various parts of Ontario and the Northern and Western States. The spring, this year, is remarkably backward ; and, even in the western part of Ontario, the mildest part of the dominion, seeding is not completed. At the same time, the winter was so mild that it will be necessary to import ice for summer use here this season.—Ontario, April 30th, 1880."—*The Colonies*, May 22nd, 1880.

THE JULY FLOODS.

THANKS to the thoughtfulness of several of our correspondents, we have received a large mass of valuable data respecting the damage produced by the floods, which resulted from the heavy rains of the latter part of July. It is, however, better to give one complete narrative than two partial ones, and moreover a record of heavy rains and of resultant floods is more appropriately printed in *British Rainfall*, than in these pages. For both these reasons we think it better to reserve our data for later use, but we must reprint one hand-bill issued as a supplement to a Stamford paper.

"FLOODS.

"In 1570, the north end of the Stamford Town Bridge was borne down by a flood, and rebuilt by William, Lord Burghley. In April, 1641, the Welland flowed half-way up to St. Mary's Church, and was 16 in. higher than the flood on Thursday, July 15th, 1880."